REMARKS

The Examiner's action dated December 28, 2004, has been received, and its contents carefully noted.

In order to correct the informalities noted in the Abstract, a replacement Abstract is submitted herewith.

In response to the rejection under 35 U.S.C. 112, second paragraph, each of claims 3 and 12 has been amended to depend directly from the preceding independent claim. As a result, there is no longer any conflict between claims 2 and 3 or between claims 11 and 12. Accordingly, it is requested that this formal rejection be reconsidered and withdrawn.

The indication of allowability of claims 7 and 16 is noted with appreciation. Since, however, it is believed that applicant is entitled to broader protection for the invention, those claims have been retained in dependent form.

The rejections presented in sections 4 and 6 of the action are respectfully traversed for the reason that the method defined in these claims, and particularly in independent claims 1 and 10, is not disclosed in or suggested by the applied reference.

As will become readily apparent from the discussion to be presented below, a significant difference between Marmsater and the present invention is that according to Marmsater, measurements are performed at fixed intervals while material

is being discharged, while according to the present invention, measurements are performed only before and after dispensing a plurality of portions of material. The reasons why this difference is of considerable practical significance will be explained below.

Marmsater (US Patent 6168305) discloses a method for controlling the discharge rate of a material feeder, which continuously discharges material stored in its material hopper to a receptacle. The method comprises repeated sampling of the material hopper weight at a fixed sampling rate. Computed loss in weight values, which are based on these weight measurements at successive time intervals T1-T0, represent the weight of material discharged over those intervals, during a continuous discharge flow. The method is based on a physical model in which the weight of material discharged during an interval equals the time integral of the instantaneous discharge rate over the corresponding time interval, which practically equals the discharge rate multiplied by this interval time. A substantially stable flow of the discharged material is essential according to Marmsater, otherwise the weight measurements and the associated desired weights are disregarded to improve the performance of the control process. The sampling moments defining these synthetic portions are arbitrarily selected.

Therefore, Marmsater is not measuring portions, as that term is employed in the practice of the present invention, because the result of each weight measurement is defined by the sampling moments, which are synchronized by a clock that is independent of the flow of the discharged material. Also setting zero to the synchronizing clock synthetically defines the leading and trailing edges of each portion.

The process of feeding material into an injection-molding machine is discontinuous, and in this respect differs from process with which Marmsater is concerned. When feeding an injection molding machine, discrete physical portions of additive, or coloring, material are discharged and fed only periodically into the machine simultaneously with the flow of the main material. Otherwise, because the material inlet of the molding machine is always filled with main material, the excess coloring material will jam back and probably destroy the feeding device. Typically the additive material feeding time interval is significantly shorter than the cycle time and in most of the cycle time of the injection-molding machine material is not discharged from the feeder. Such short time intervals and a non-stable flow of material create a challenge, which is beyond the capabilities of the Marmsater method.

Implementation of the procedure disclosed in the Marmsater reference will be (column 3 lines 30-60) as follows: <u>as soon as the plasticization phase and the discharging of the material starts, simultaneously sampling</u> the weight of the loss-in-weight hopper at a rate of approximately 30 times per second and storing these readings in an array of 100 values. This routine will last at least 3 sec. This array of weight measurements is updated by replacing the oldest sample weight value with the most recent sample weight value. The array of 100 weight measurements is totaled and an average weight, WA, is obtained for the values stored in the array. A second array of 100 average weights WA is formed and is also continuously updated by discarding the oldest average weight in favor of the newest average weight.

The average weight values of the average weight array over intervals T0 to T1 are subtracted, thus a loss in weight WLA between the intervals T0-T1, which is typically 200 milliseconds, is obtained. Subsequently, percent errors, EW, are calculated based on the difference between the actual loss in weight, WLA, and a desired loss in weight, WLD.

The values of EW computed for each time interval in which a loss in weight is computed forms an array of 100 error values.

Furthermore according to the Background of the Invention section of the Marmsater reference (column 1 lines 5-25): "The major disadvantage of this (Johnson U.S Pat. NO. 5,103,401) and other loss-in-weight algorithms lies in the fact that the derivation of the loss is subject to disturbances from many influences. These disturbances cause a perturbation on the controlling output which in turn causes a perturbation in the loss of material. The resulting perturbation in the loss of material is in turn sensed by the control algorithm and an incorrect change in output is made. These disturbances can in severe cases lead to oscillation of the controlling output and hence erratic feeding of material." The final section of the above quoted passage exactly describes what will happen in the relatively very low percentage of cases it is theoretically possible to implement the Marmsater reference, i.e. when the cycle time is long enough, like in the cases of large injected products, to enable the Marmsater reference to achieve the control signal.

The Marmsater reference explains in the Summary of the Invention portion (column 1 lines 26 -32) that it "overcomes these disadvantages and provides more stable control of the discharge of the material by maintaining a model of the weight loss with respect to discharge speed for control of the discharge speed wherein the model for weight loss is updated

continuously only when the weight loss is constant and stable."

The weight samplings of the loss-in-weight hopper, if the the Marmsater procedure were to be implemented in an injection molding machine (which is not disclosed in that reference), would be taken during the injection molding phase, when the molding machine feed screw is rotating, since the weight samplings must be taken, according to Marmsater, while material is being discharged. During this phase, vibrations of the injection molding machine and the material feeding equipment will introduce a very significant amount of noise into the weight signal, as well as causing sensor drift.

Therefore, it is clear that in the case of feeding of material to an injection molding machine, the procedure disclosed by the Marmsater reference can not provide an improvement over the procedure taught in the Johnson patent.

Moreover, as already noted above, Marmsater does not provide any indication that the method disclosed therein is to be used to control material fed to an injection molding machine.

The present invention provides an improved method for controlling the supply material to an injection molding machine, to which material is delivered only periodically. Marmsater does not contemplate delivery of material to an

injection molding machine and does not contemplate delivering material periodically. Thus, the present invention carries out loss-of-weight measurements in a manner fundamentally different from that disclosed by Marmsater.

Specifically, according to the method of the present invention, the hopper from which material is dispensed is weighed before and after a dispensing step, when the feed hopper is inactive. Thus, the weighing steps take place when the hopper is inactive, so that the weighings are not falsified by hopper vibrations. In clear contrast, Marmsater only discloses a weighing procedure that takes place while material is being dispensed.

Thus, independent claims 1 and 10 clearly define a method that differs fundamentally from that disclosed in the applied reference and that more accurately controls the feeding of portions of material from a loss in weight hopper by specifying that the method is applied to an injection molding machine, and includes the following novel sequence of steps:

In the first step, at the rest phase in the injection molding process, weighing the loss-in-weight hopper;

After said first weighing step, dispensing a number of successive portions of material from the loss-in-weight hopper;

Then, in a second weighing step, after said dispensing step, weighing said hopper; and

Performing calculating and dividing steps, based on the first and second weighings, to determine the weight of each portion.

The difference between the two measured weights will constitute the loss of weight of the hopper. Dividing the loss of weight of the hopper by said number of portions will constitute the measured average portion weight of the material per discrete cycle.

As defined in claims 8 and 17, the feeder is then controlled to dispense more or less material during subsequent injection molding cycles depending upon whether the calculated portion weight is more or less than a predetermined portion weight.

At the times when no material is being dispensed, between plasticization phases in the injection molding machine, there is no movement of the hopper, so that the recording of weight values measured at the time of these resting phases will be achieved with a high accuracy. Therefore, one particular advantage of the present invention is that the weight measurements of the loss-in-weight hopper can take place during the resting phases of the injection molding unit.

Contrary to the Marmsater method, weight is sampled according to the present invention only at points in time in which material is not being discharged from the material hopper. The timing of weight sampling is not arbitrarily selected by an internal clock of the controller of the feeder, such as is done in the Marmsater method, but is synchronized with the different steps of the injection-molding machine. This is done in order to minimize the effect on the weighing operations of mechanical shocks and vibrations, which are typically associated with screw conveyor movement, and the opening and closing of the mold in each and every machine cycle.

It is therefore submitted that the method defined in the claims rejected in section 4 of the action is not anticipated by Marmsater and the claims rejected in section 4 of the action are not in any way suggested by that reference. In fact, for reasons advanced above, it can properly be said that Marmsater teaches away from the claimed invention.

Added claims 19 and 20 state even more specifically that weighing steps occur at times different from dispensing steps. It is believed that this limitation is already contained in claims 1 and 10, but the added claims have been presented only for the sake of further clarification.

In view of the foregoing, it is submitted that all of the pending claims clearly distinguish over the applied reference and it is therefore requested that the prior art rejections be reconsidered and withdrawn, that claims 1-20 be allowed and that the Application be found in allowable condition.

If the above amendment should not now place the application in condition for allowance, the Examiner is invited to call undersigned counsel to resolve any remaining issues.

Respectfully submitted,

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